

SHORT COMMUNICATION

**SHOULD THERE BE MORE TREE VEGETATION IN THE
MEDITERRANEAN CLIMATIC REGION OF SOUTH AFRICA?**

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ABSTRACT

Recent comparative studies of the forest vegetation of the mediterranean regions of California and South Africa, general accounts of the vegetation of the mediterranean regions of the world, and the spread of introduced trees and tall shrubs into the indigenous fynbos vegetation of South Africa, suggest that the South African mediterranean region should support a much more extensive tree vegetation.

UITTREKSEL

BEHOORT DAAR 'N GROTER BOOMBEVOLKING IN DIE MIDDELANDSE
SEE-KLIMAATSGEBIED VAN SUID-AFRIKA TE WEES?

Onlangse vergelykende studies van die woudplantegroei van die Middelandse Seegebiede van Kalifornië en Suid-Afrika, en algemene beskrywings van die plantegoei van die Middelandse Seegebiede van die wêreld, en die verspreiding van indringerbome en -struie in die fynbosplantegroei van Suid-Afrika, dui daarop dat die Suid-Afrikaanse Middelandse Seegebied 'n veel groter boombevolking behoort te onderhou.

INTRODUCTION

The mediterranean climatic region of South Africa (*sensu lato*, as given by UNESCO-FAO, 1963) is dominated by a sclerophyllous scrub, fynbos, which "is largely devoid of native trees" (Kruger, 1978). Tree vegetation, forest in this case, is more or less restricted to sheltered valleys and patches of rock scree (Campbell & Moll, 1977). Growth of the native trees is probably precluded on fynbos sites by the seasonally severe soil moisture deficits and by the periodic fires that occur on these sites (Kruger, 1978).

There is evidence to suggest that the mediterranean region of South Africa should support an extensive vegetation of trees that can withstand the seasonally severe soil moisture deficits and the periodic fires. Why are such trees absent?

This paper will deal with the evidence indicating that there should be more tree vegetation.

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EVIDENCE INDICATING THAT THE SOUTH AFRICAN MEDITERRANEAN REGION SHOULD SUPPORT A MUCH MORE EXTENSIVE TREE VEGETATION

(1) *Semi-detailed comparative studies of the evergreen, broad-leaved, sclerophyllous forests of the mediterranean regions of South Africa and California* (Campbell, McKenzie & Moll, in prep.)

In this recent comparative study of the forests of these regions it is indicated that, even though the climatic and fire conditions are similar, there is a relative lack, in South Africa, of evergreen sclerophyllous forest or woodland at high altitudes (above 800 m), and on low-altitude xeric slopes (Fig. 1). This phenomenon is the case even though the South African mediterranean region has more favourable climatic conditions for the growth of evergreen, broad-leaved, sclerophyllous trees (i.e. a less severe summer drought and a higher annual precipitation—Campbell *et al.*, in prep.).

(2) *General vegetation accounts of mediterranean climatic regions*

From general accounts of the vegetations of mediterranean-type climates it is apparent that the South African region has less extensive evergreen, broad-leaved, sclerophyllous tree formations than any of the other regions. The forest in the South African region was more extensive when European man first settled at the Cape 300 years ago (Sim, 1907; and see the map in Campbell & Moll, 1977, showing the probable distribution of forest on Table Mountain in 1600 A.D.), but this forest (or woodland) was never as extensive as in the other mediterranean regions where climates are similar and where fire is also a feature of the environment. Acocks (1953) mapped almost no forest in the mediterranean region of South Africa on his 1:1 500 000 map of the veld types of South Africa. Under similar climatic conditions in Western Australia, there are extensive areas of tree formations—mainly *Eucalyptus* woodland (Walter, 1973; see also the 1:6 000 000 vegetation map of Australia, Department of National Resources, 1976). The analogous climatic area in Chile has more extensive tree formations (Walter, 1973; E. Moll, pers. obs.), there is no doubt that the area around the Mediterranean Sea once supported extensive *Quercus ilex* forest (Walter, 1973), and finally, California has more extensive tree formations (mainly woodland) than the South African region (see Kuchler's, 1964, 1:3 168 000 map of the potential natural vegetation of the U.S.A., and the U.S. Forest Service vegetation type maps of Southern California).

Other workers have also noted the relative lack of trees in the South African region as compared to other mediterranean regions. Levyns (1961) notes this when comparing the South African and Australian regions. Adamson (in Wicht, 1945) wrote "as compared with Australia or the Mediterranean, a striking dissimilarity is the absence of trees". Kruger (1978) notes that the effective precipitation indices (Bailey, 1958, in Kruger) at many of the South African stations "in

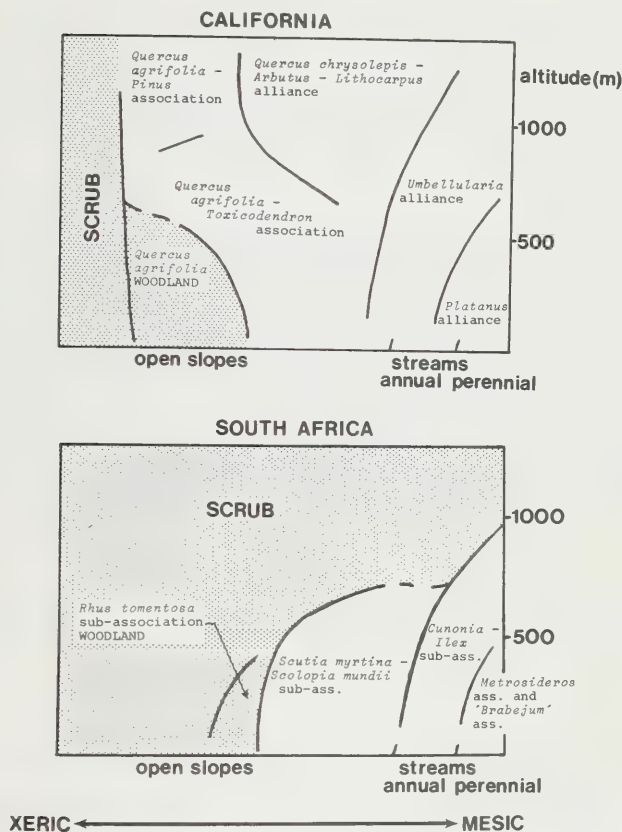


FIG. 1

The proposed relationships of the forest types in California (Campbell, 1979) and South Africa (Campbell and Moll, 1977) to altitude and moisture gradients. The unshaded area represents forest. The shaded area represents scrub.

mountains and wetter valleys have indices over 10 and these stations on other continents, would have a forest cover”.

(3) The spread of introduced trees and shrubs in fynbos

The fynbos is particularly prone to invasion by introduced tall shrubs and trees (e.g. *Acacia* spp., *Hakea* spp., *Albizia* and *Pinus* spp.; see, e.g., Hall & Boucher, 1977). This invasion of introduced tall shrubs and trees does not appear to occur in

the other mediterranean regions (at least in Australia and California), and successful invasion of fynbos by these species "is not dependent on disturbance of the habitat" (Kruger, 1977). There are many reasons why the fynbos is particularly prone to invasion. One possibility is that the invasive trees and tall shrubs have little competition because of the relative absence of native trees in the fynbos.

CONCLUSIONS

If we can accept the suggestion in this paper that the South African mediterranean region should have a more extensive tree formation, what are the reason(s) for this phenomenon? What has caused the absence of trees that can withstand summer soil moisture deficits and periodic fires? Have such trees failed to evolve, and, if so, why? Is the absence of such trees related to the relatively recent activities of man (i.e. in the last 10 000 years) or to the climatic changes of the pleistocene? Furthermore, how is the absence related to the uniqueness of the fynbos biome? The fynbos biome only makes up 0.04 % of the world's vegetated surface and yet is one of the six floristic kingdoms of the world (Oliver, 1977). Questions like these indicate the great need for palaeoecological investigations in fynbos, and detailed comparative studies of all the mediterranean regions of the world.

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REFERENCES

- ACOCKS, J. P. H., 1953. Veld types of South Africa. *Mem. bot. Surv. S. Afr.* **28**: 1-192.
- CAMPBELL, B. M., 1979. Some mixed hardwood forest communities of the coastal ranges of southern California. *Phytocoenologie* (in press).
- CAMPBELL, B. M., MCKENZIE, B. M. and MOLL, E. J. Forest vegetation comparisons between the mediterranean climatic regions of California and South Africa (in prep.).
- CAMPBELL, B. M. and MOLL, E. J., 1977. The forest communities of Table Mountain, South Africa. *Vegetatio* **34**: 105-115.
- DEPARTMENT OF NATIONAL RESOURCES, 1976. *Natural Vegetation*. Canberra: Atlas of Australian resources, Dept. of National Resources.
- HALL, A. V. and BOUCHER, C., 1977. The threat posed by alien weeds to the Cape flora. *Proc. 2nd Natn. Weeds Conf. S. Afr.*: 35-45. Cape Town: Balkema.
- KRUGER, F., 1977. Invasive woody plants in the Cape fynbos with special reference to the biology and control of *Pinus pinaster*. *Proc. 2nd Natn. Weeds Conf. S. Afr.*: 57-74. Cape Town: Balkema.
- KRUGER, F., 1978. South African heathlands. In: R. L. Specht (ed.), *Heathlands of the world*. Amsterdam: Elsevier.
- KUCHLER, A. W., 1964. Map of the potential natural vegetation of the conterminous United States. *Spec. Publ. Am. geogr. Soc.* **36**.

- LEVYNS, M. R., 1961. Some impressions of a South African botanist in temperate Western Australia. *Jl S. Afr. Bot.* **27**: 87-97.
- OLIVER, E. G. H., 1977. An analysis of the Cape flora. *Proc. 2nd Natn. Weeds Conf. S. Afr.*: 1-18. Cape Town: Balkema.
- SIM, T. R., 1907. *The forests and forest flora of the Cape Colony*. 361 pp. Aberdeen, Scotland: Taylor and Henderson.
- UNESCO-FAO, 1963. Bioclimatic map of the mediterranean zone. Explanatory notes. *Arid Zone Res.* **21**: 1-26.
- WALTER, H., 1973. *Vegetation of the earth in relation to climate and the eco-physiological conditions*. 237 pp. New York: Springer-Verlag.
- WICHT, C. L., 1945. Report on the committee on the preservation of the vegetation of the South Western Cape. *Spec. Publs R. Soc. S. Afr.* 56 pp.